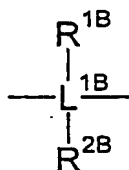


We claim:

1. A monocyclopentadienyl complex which comprises the structural feature of the formula (Cp)(-Z-A)_mM (I), where the variables have the following meanings:

Cp is a cyclopentadienyl system,

Z is a bridge between A and Cp of the formula,



where

L^{1B} are each, independently of one another, carbon or silicon,

R^{1B} is C₂-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}₃, where the organic radical R^{1B} may also be substituted by halogens and R^{1B} and A may also be joined to form a five- or six-membered ring,

R^{2B} is hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}₃, where the organic radical R^{2B} may also be substituted by halogens and R^{2B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, heteroaromatic ring system,

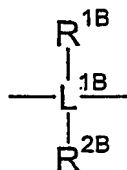
M is a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten and

m is 1, 2 or 3.

2. A monocyclopentadienyl complex as claimed in claim 1 having the formula (Cp)-
 (-Z-A)_mMX_k (VI), where the variables have the following meanings:

Cp is a cyclopentadienyl system,

Z is a bridge between A and Cp of the formula,



where

L^{1B} are each, independently of one another, carbon or silicon,

R^{1B} is C₂-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}₃, where the organic radical R^{1B} may also be substituted by halogens and R^{1B} and A may also be joined to form a five- or six-membered ring,

R^{2B} is hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}₃, where the organic radical R^{2B} may also be substituted by halogens and R^{2B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, heteroaromatic ring system,

M is a metal selected from the group consisting of titanium in the oxidation state 3, vanadium, chromium, molybdenum and tungsten,

m is 1, 2 or 3,

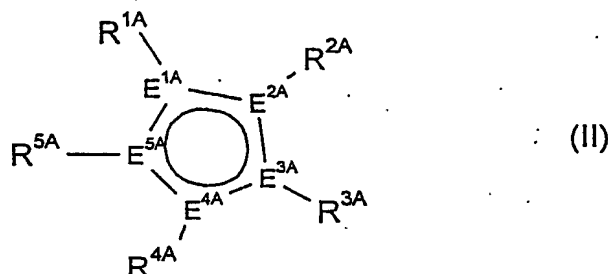
X are each, independently of one another, fluorine, chlorine, bromine, iodine, hydrogen, C₁-C₁₀-alkyl, C₂-C₁₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having 1-10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR¹R², OR¹, SR¹, SO₃R¹, OC(O)R¹, CN, SCN, β-diketonate, CO, BF₄⁻, PF₆⁻ or a bulky noncoordinating anion,

R¹-R² are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR³₃, where the organic radicals R¹-R² may also be substituted by halogens and two radicals R¹-R² may also be joined to form a five- or six-membered ring,

R³ are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R³ may also be joined to form a five- or six-membered ring and

k is 1, 2, or 3.

3. A monocyclopentadienyl complex as claimed in claim 1 or 2, wherein the cyclopentadienyl system Cp has the formula (II):



where the variables have the following meanings:

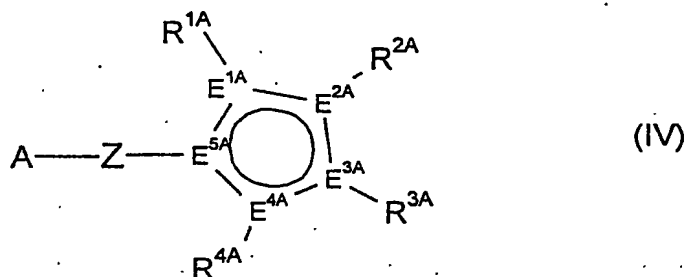
E^{1A}-E^{5A} are each carbon or not more than one E^{1A} to E^{5A} is phosphorus,

R^{1A}-R^{5A} are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}₂, N(SiR^{6A}₃)₂, OR^{6A}, OSiR^{6A}₃, SiR^{6A}₃, BR^{6A}₂, where the organic radicals R^{1A}-R^{5A} may also be substituted by halogens and two vicinal radicals R^{1A}-R^{5A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A}-R^{5A} are joined to form a heterocycle which contains at least one atom

from the group consisting of N, P, O and S, with 1, 2 or 3 substituents R^{1A} - R^{5A} each being a -Z-A group and

R^{6A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring.

4. A monocyclopentadienyl complex as claimed in any of claims 1 to 3, wherein the cyclopentadienyl system Cp together with -Z-A has the formula (IV):



where the variables have the following meanings:

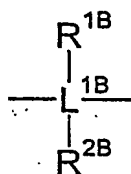
E^{1A} - E^{5A} are each carbon or not more than one E^{1A} to E^{5A} is phosphorus,

R^{1A} - R^{4A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 , where the organic radicals R^{1A} - R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A} - R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A} - R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

A is an unsubstituted, substituted or fused, heteroaromatic ring system,

Z is a bridge between A and Cp of the formula,



5

where

L^{1B} are each, independently of one another, carbon or silicon,

10

R^{1B} is C_2 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3 , where the organic radical R^{1B} may also be substituted by halogens and R^{1B} and A may also be joined to form a five- or six-membered ring,

15

R^{2B} is hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3 , where the organic radical R^{2B} may also be substituted by halogens and R^{2B} and A may also be joined to form a five- or six-membered ring,

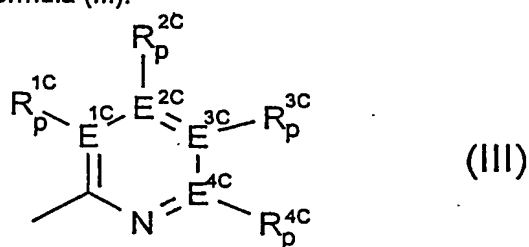
20

R^{3B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring.

25

5. A monocyclopentadienyl complex as claimed in any of claims 1 to 4, wherein A has the formula (III):

30



35

where

E^{1C} - E^{4C} are each carbon or nitrogen,

R^{1C} - R^{4C}

are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 , where the

40

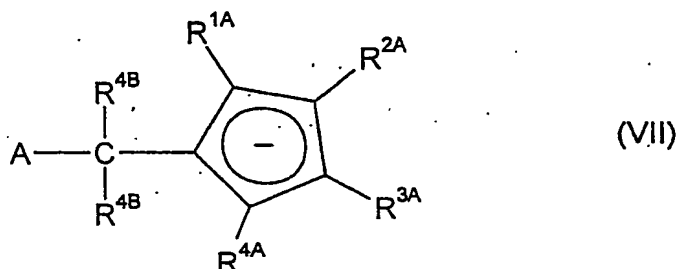
organic radicals R^{1C} - R^{4C} may also be substituted by halogens or nitrogen or further C_1 - C_{20} -alkyl groups, C_2 - C_{20} -alkenyl groups, C_6 - C_{20} -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 and two vicinal radicals R^{1C} - R^{4C} or R^{1C} and Z may also be joined to form a five- or six-membered ring,

R^{5C} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{5C} may also be joined to form a five- or six-membered ring and

p is 0 when E^{1C} - E^{4C} is nitrogen and is 1 when E^{1C} - E^{4C} is carbon.

- 15 6. A monocyclopentadienyl complex as claimed in any of claims 1 to 5, wherein L^{1B} is carbon.
7. A monocyclopentadienyl complex as claimed in any of claims 1 to 6, wherein Z is $-CH(C_6H_5)-$.
- 20 8. A catalyst system for olefin polymerization comprising
 - A) at least one monocyclopentadienyl complex as claimed in any of claims 1 to 7,
 - 25 B) optionally an organic or inorganic support,
 - C) optionally one or more activating compounds,
 - D) optionally one or more catalysts suitable for olefin polymerization and
 - 30 E) optionally one or more metal compounds containing a metal of group 1, 2 or 13 of the Periodic Table.
9. A prepolymerized catalyst system comprising a catalyst system as claimed in claim 8 and one or more linear C_2 - C_{10} -1-alkenes polymerized onto it in a mass ratio of from 1:0.1 to 1:1 000, based on the catalyst system.
- 35 10. The use of a catalyst system as claimed in claim 8 or 9 for the polymerization or copolymerization of olefins.

11. A process for preparing polyolefins by polymerization or copolymerization of olefins in the presence of a catalyst system as claimed in claim 8 or 9.
12. A process for preparing cyclopentadienyl system anions of the formula (VII),



where the variables have the following meanings:

R^{1A} - R^{4A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 where the organic radicals R^{1A} - R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A} - R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A} - R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

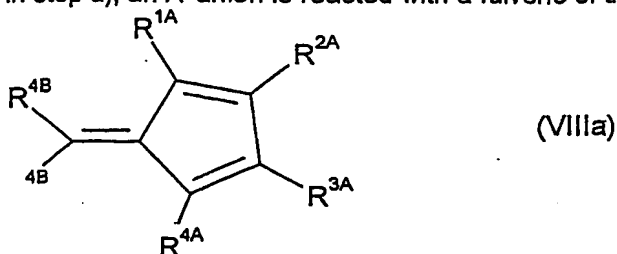
A is an unsubstituted, substituted or fused, heteroaromatic ring system,

R^{4B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3 , where the organic radicals R^{4B} may also be substituted by halogens and two geminal or vicinal radicals R^{4B} may also be joined to form a five- or six-membered ring and

R^{3B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

which comprises the step a) or a'), where,

in step a), an A^- anion is reacted with a fulvene of the formula (VIIIa)



or,

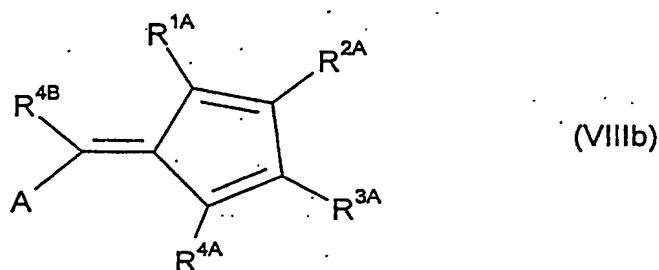
in step a'), an organometallic compound $R^{4B}M^BX^B$, where

M^B is a metal of group 1 or 2 of the Periodic Table of the Elements,

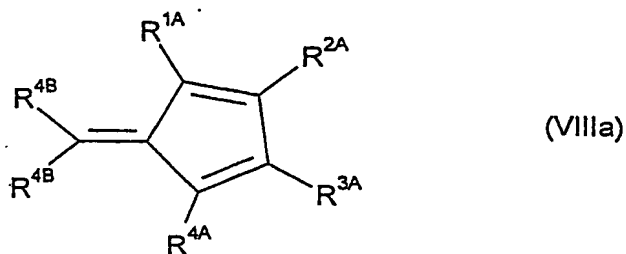
X^B is halogen, C_1-C_{10} -alkyl, alkoxy having from 1 to 20 carbon atoms in the alkyl radical and/or from 6 to 20 carbon atoms in the aryl radical, or R^{2B} and

b is 0, when M^B is a metal of group 1 of the Periodic Table of the Elements and is 1 when M^B is a metal of group 2 of the Periodic Table of the Elements,

is reacted with a fulvene of the formula (VIIIb):



13. A process for preparing cyclopentadiene systems of the formula (VIIa)



where the variables have the following meanings:

$E^{6A}-E^{10A}$ are each carbon, where in each case four adjacent $E^{6A}-E^{10A}$ form a conjugated diene system and the remaining $E^{6A}-E^{10A}$ additionally bears a hydrogen atom,

R^{1A} - R^{4A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, NR^{6A}_2 , $N(SiR^{6A}_3)_2$, OR^{6A} , $OSiR^{6A}_3$, SiR^{6A}_3 , where the organic radicals R^{1A} - R^{4A} may also be substituted by halogens and two vicinal radicals R^{1A} - R^{4A} may also be joined to form a five- or six-membered ring, and/or two vicinal radicals R^{1A} - R^{4A} are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S,

R^{6A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{6A} may also be joined to form a five- or six-membered ring,

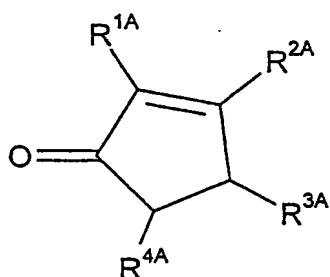
A is an unsubstituted, substituted or fused, heteroaromatic ring system,

R^{2B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{3B}_3 , where the organic radicals R^{2B} may also be substituted by halogens and R^{2B} and A may also be joined to form a five- or six-membered ring,

R^{3B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{3B} may also be joined to form a five- or six-membered ring,

which comprises the following step:

a") reaction of an $A-CR^{2B}R^{2B-}$ anion with a cyclopentenone system of the formula (IX)



(IX)